



# Profile of Poisoning at a Tertiary Care Hospital in Haryana

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## ABSTRACT

**Introduction:** Poisonings continues to be a frequent reason for admission to hospitals and intensive care units in the developing countries. The fatal issue is often related to delay in diagnosis and improper management.

**Aim:** The purpose of the study is to report the morbidity, mortality and survival pattern of poisoning cases received at a tertiary care centre at Haryana. The focus was also in depicting the signs and symptoms of various poisoning for early diagnosis.

**Methods:** This was a retrospective study consisting of patients admitted with poisoning during the period January 2017 to December 2017, in a tertiary care centre in Haryana. Total of 200 patients admitted with poisoning were analyzed. Diagnosis was made on basis of history of exposure and characteristic clinical picture, with emphasis given to age, sex, month of year, motive of poisoning, type of compound, clinical presentation and final outcome of poisoning

**Results:** Among the 200 cases, 127 (63.5%) cases of aluminium phosphide and 58 (29%) cases of organophosphate poisoning were observed. Few cases of tricyclic antidepressants poisoning (2%), zinc phosphide poisoning (2%) herbicide (2.5%), phenol and transfluthrin (all out) ingestion (0.5%) each were reported. The most common motive of poisoning (95.5%) was with a suicidal intent. Out of the 200 poisoning cases 146 (73%) cases admitted survived on treatment and a mortality rate of 27% was reported. 90.7% of the deaths were due to aluminium poisoning ingestion, while mortality due to organophosphate poisoning was just 7.4%. Maximum cases were observed in the age-group of 21-30 years which holds 72 (36%) cases followed by 49 (26%) cases in 31-40 years. Males outnumbered females in every age group. 92.5% of the cases were from rural background, while only 7.5% of the urban inhabitants were affected by poisoning.

**Conclusion:** Aluminium phosphide ingestion is the leading cause of deaths due to poisonings observed in Haryana, predominantly seen in youths residing in rural areas with male preponderance. Low cost of these compounds, easy availability at peak moments of frustration; due to marital discord, poor economic growth has pushed up the incidence of self poisoning. Hence up gradation of primary health care facilities to render immediate management of these poisoning cases could go a long way in helping to reduce mortality and morbidity.

**Key Words:** Poisoning, Aluminium phosphide, Organophosphate, Suicidal

## INTRODUCTION

Poisoning among all age groups and both sexes is known worldwide. Poisoning accidental or intentional is significant contributor to mortality and morbidity all over the world. According to WHO pesticide self poisoning or accidental exposure is responsible for afflicting 300,000 people every year with 22000 deaths in developing countries especially those from rural background. <sup>1</sup> India being an agriculture based

country use of pesticides, rodenticides and herbicides remain the main agent of pest control and crop protection. Low cost, easy availability, efficacy of action and rapid death have made these compounds the agent of choice for self poisoning. <sup>2</sup> It has been estimated that 5-6 persons per lakh of population die due to poisoning every year in India. This figure could just be the tip of the iceberg since most cases of poisoning actually go unreported. High mortality could be due to lack of hospital services in the vicinity, delayed transport

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,non availability of specific antidote, and increased patient to care givers ratio or an improper management.<sup>3</sup>

Aluminium Phosphide (AIP) commonly known as celphos or wheat pill is used to preserve grains all over the world, is one of the dreaded poisons encountered in toxicology. AIP when ingested releases phosphine gas on contact with moist surfaces or HCL that causes cell hypoxia due to inhibition of oxidative phosphorylation leading to circulatory failure.<sup>4</sup> Patients can present clinically with gastrointestinal hemorrhage, arrhythmias, shock, renal, and hepatic failure and CNS disturbances. Patients remain mentally clear till cerebral anoxia due to shock supervenes resulting in coma. ECG changes ranging from ST segment elevation or depression, PR and QRS interval prolongation, complete heart block and fibrillation has been observed. Toxic chemical myocardial inflammation manifests as depressed left ventricular ejection fraction. Treatment of AIP poisoning is mainly supportive and there is no specific antidote. Mortality with AIP poisoning is very high, almost 100%.<sup>5</sup>

Organophosphate compound (OPC) a common pesticide used in agriculture for crop protection is implicated in accidental and suicidal poisoning with 4-30% mortality in Indian studies.<sup>1</sup> Acetylcholine is a neurotransmitter present at the neuromuscular junction in peripheral and central nervous systems. Acetylcholinesterase (AChE) is an enzyme that hydrolyses and breaks down acetylcholine. Organophosphate compounds cause phosphorylation and inactivation of this enzyme leading to accumulation of acetylcholine. The inhibition of AChE with subsequent accumulation of acetylcholine at synapses results in overstimulation and disruption of neuronal endings in both central and peripheral nervous system. Complications of OPC poisoning include aspiration of gastrointestinal contents, excessive secretions, neuromuscular involvement, intermediate syndrome, septicemia and adult respiratory distress syndrome.<sup>6,7</sup> The fatal issue is often related to delay in diagnosis and improper management. Management of severe poisoning is difficult requires intensive care management with atropine and oxime cholinesterase reactivators. Key to survival lies in early diagnosis followed by rapid decontamination and definitive therapy.

Zinc phosphide a rodenticide, dark grey crystalline compound used to kill field mice and rat. It reacts with water and gets converted to phosphine gas in the body on ingestion in the stomach. Zinc phosphide is used widely by young members of society for suicidal attempts.<sup>8</sup> The clinical symptoms arise due to metabolic and non metabolic effects of phosphine gas and manifest as hypotension, shock, pericarditis, pulmonary edema and congestive heart failure.<sup>9</sup> The mortality rate varies from 37%-100% as no antidote is currently available nor a specific treatment protocol has been provided. Gastric flushing and charcoal treatment only is recommended. Apart from gastrointestinal symptoms, Chug

et al.1998<sup>10</sup> reported in their studies that oliguria, coma, convulsions, hepatotoxicity and thrombocytopenia could be seen in zinc phosphide poisoning. Due to extent of damage to lungs and heart patients are lost at early stages.

Phenol (carbolic acid) is an oldest antiseptic agent used in households for cleansing floors. Phenol is a protoplasmic poison with corrosive local effects. Phenol when ingested causes extensive local corrosions. Excruciating pain, nausea vomiting, sweating and diarrhea are the presenting symptoms. Severe GIT burns and strictures are its long term complications. Systemic manifestations develop after 5-30 minutes post ingestion producing hypotension, tachycardia/ bradycardia, dysarrhythmias, seizures acidosis hemolysis, meth-haemoglobinemia and shock. Dose is between 3-30gram is lethal.<sup>11</sup> Early medical intervention following immediate medical evaluation helps in survival. Gastric lavage is not recommended if phenol is ingested. Immediate administration of olive oil and activated charcoal by nasogastric tube is necessary. Decontamination of skin and eyes with copious amount of water followed by undiluted polyethylene glycol is recommended. Intravenous fluid administration and dopamine infusions can be lifesaving. Arrhythmias are corrected with lidocaine infusion, convulsions with diazepam.<sup>12</sup>

Deaths due to tricyclic antidepressant (TCA) poisoning is due to arrhythmias or hypotension mainly due to quinidine like actions on heart tissues.<sup>13</sup> TCA are extensively used for management of depression and other psychiatric diseases. TCA poisoning caused by excessive medication accounts for 270 deaths per year in the United Kingdom. Symptoms include elevated body temperature, blurred vision, dilated pupils, sleepiness, confusion seizures and rapid heart rate even cardiac arrest. Seizures and coma are common complications. Fatality is a result of cardiovascular toxicity. Prompt transport of patient to the nearest emergency department is implicit. Sodium bicarbonate is still considered the treatment of choice apart from supportive management.<sup>14</sup>

Since there is paucity of literature regarding poisoning in Haryana, this particular observational study was undertaken. Aim to predict morbidity, mortality and survival pattern of poisoning. An attempt has been made to provide recommendations for treatment and prevention of death by poisons on rampage in Haryana.

## MATERIALS AND METHODS

The study constituted patients with poisoning admitted to intensive care unit between January 2017 to December 2017 at BPS Government Medical College for Women, Sonapat, Haryana a referral tertiary care center. Ethical clearance was obtained from hospital administration for disclosure of record details only for academic purpose. However, confidentiality was maintained as neither name or CR number of the

patient was documented. A total of 200 poisoning cases were analyzed during this period. Diagnosis was made on basis of history of exposure and characteristic clinical picture. Plasma cholinesterase levels could not be analyzed because of non-availability in the hospital. Data was collected from all poisoning cases in a detailed performa as per history given by the patient or relatives, with emphasis given to age, sex, month of year, motive of poisoning, type of compound, clinical presentation and final outcome.

Treatment was started as per the hospital protocol for managing patients of poisoning. The body was washed with soap and water after removal of clothes. Nasogastric tube was passed to decompress the stomach and gastric lavage was done in all the patients. Patients of OPC poisoning were treated with atropine, pralidoxime and respiratory support if required. A loading dose of 3 mg of atropine was given immediately followed by a maintenance dose of 8 mg hourly until target end point of atropination was achieved documented by (1) a clear chest on auscultation with no wheeze (2) heart rate of  $>72$  /min and (3) Dilated pupils. PAM was administered with a bolus of 2gm over a period of 4 hours. Patient with Glasgow coma scale of less than 8 with hypoxia were intubated and mechanically ventilated.

Patients with aluminium phosphide poisonings were confirmed by history and typical odour of the compound. Airway protection was given before gastric lavage. Gastric lavage with diluted potassium permanganate, coconut oil, sodium bicarbonate and activated charcoal was performed. Supportive treatment with IV fluids, magnesium sulfate infusion was given. Vasopressors and inotropic drugs were administered in patients with hypotension. Patients with unstable hemodynamic were mechanically ventilated. Monitoring of hemodynamic parameters, urine output, arterial blood gases and blood pressure was regularly done in all patients of poisoning. All patients were dealt up to recovery or death from poisoning.

## RESULTS

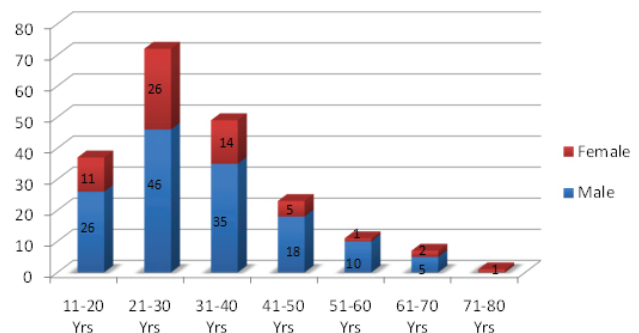
A total of 200 cases of poisoning due to various compounds were registered during the study period from January 2017 to December 2017 in the emergency department.

The socio-demographic profile of the patients is as follows. The age of the patients varied from 11 to 75 years. Maximum cases were observed in the age-group of 21-30 years which holds 72 (36%) cases followed by 49 (26%) cases in 31-40 years and 18.5% of poisoning cases in 11-20 years age group. Males outnumbered females in every age group except above 71 years and above. Male to female ratio is 2.33:1. The most striking feature was observed in 51-60 years age group male to female ratio afflicted by poisoning was highest 10:1 as given in the Table 1.

**Table 1: Age group wise distribution of poisoning cases**

Age Group (In Years)	Male	Female	No. of Cases	Male female ratio
11-20	26	11	37	2.36:1
21-30	46	26	72	1.76:1
31-40	35	14	49	2.5:1
41-50	18	5	23	3.6:1
51-60	10	1	11	10:1
61-70	5	2	7	2.5:1
71 and above	Nil	1	1	-
Total	140	60	200	2.33:1

## Age Group Wise Distribution



**Figure 1: Bar Diagram shows age group wise distribution**

The plotted bar diagram has its peak age 21-30 years holding a total of 72 cases accounting for 36% followed by 31-40 years age group with 49 (26%) cases. 37 cases of poisoning in the 1<sup>st</sup> decade (18.5%) and 23 cases (11.5%) in the 5<sup>th</sup> decade have been observed. Poisoning cases have been observed in the elderly individuals also, amounting to an incidence of 5.5% in the 51-60 and 3.5% incidence in 61-70 year age group as shown in Table 1.

**Table 2: Residence wise distribution of poisoning cases**

Residence	Number	Percentage (%)
Rural	185	92.5
Urban	15	7.5

Most of the poisoning cases were from rural areas of Haryana. Occupation wise agriculture was on top of the list 92.5%.

**Table 3: Month wise distribution of poisoning cases**

Month	No. of cases	Percentage (%)
January	10	5
February	10	5

March	27	13.5
April	14	7
May	12	6
June	22	11
July	22	11
August	16	8
September	22	11
October	27	13.5
November	11	5.5
December	7	3.5
Total	200	

The study reflects the frequency of poisoning cases received during different months of the year. Maximum number of cases were received in the months of March and October 13.5% respectively. June, July and September, received 22 (11%) cases each of poisoning. December witnessed the

least number of poisoning cases just 7 only (3.5%) as depicted in Table 3.

Table 4 shows that 127 out of 200 cases (63.5%) consumed aluminium phosphide. AIP (celphos) ingestion was the leading cause of death with total number 48 cases (88.8%) received in the ICU. 58(29.9%) cases of OPC poisoning were observed. Zinc phosphide and tricyclic antidepressant poisoning were witnessed in 4 cases each. Herbicide poisoning was seen in 5 cases all with a suicidal intent. A very striking poisoning due to mosquito repellent ingestion, transfluthrin sold under the brand "All-out" was received at the emergency department of the institute not heard otherwise.

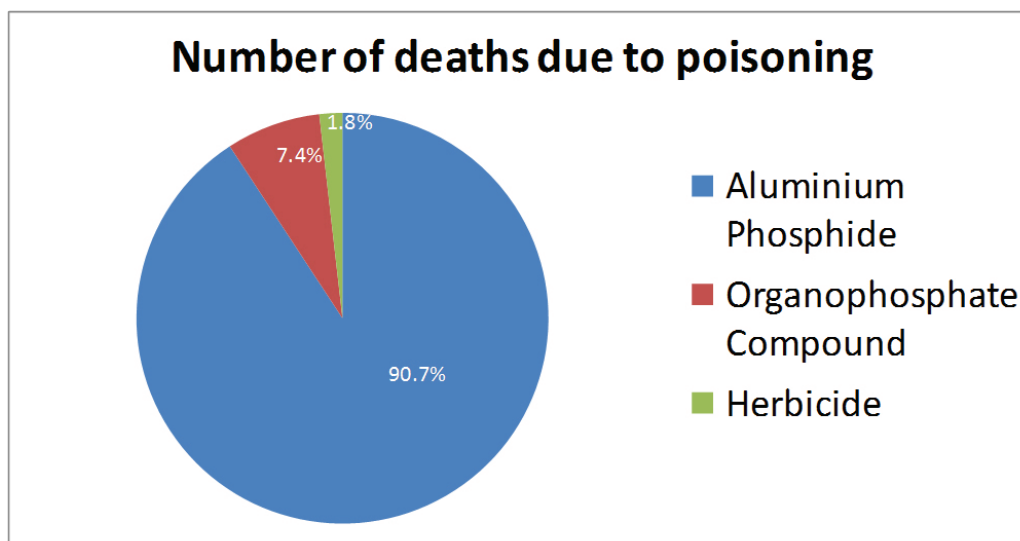
The commonest motive of poisoning was suicidal(95.5%), accidental only 4.5%. Self poisoning with organophosphate (86.5%) has been observed with only 13.4% accidental exposure cases being reported. However all cases of AIP, zinc phosphide poisonings and herbicide ingestion were with a suicidal intent.

**Table 4: Motive of poisoning using various compounds**

Motive of poisoning	Aluminium phosphide (AIP)	OPC	Zinc Phosphide	TCA	Herbicide	Phenol (phenyl)	Transfluthrin (Allout)
Total number of cases	127	58	4	4	5	1	1
Suicidal(%)	127(100%)	50(86.6%)	4(100%)	4(100%)	5(100%)	-	1
Accidental(%)	nil	8(13.4%)	-	-	-	1	-

**Table 5: Outcome of poisoning cases**

S. No.	Outcome	Patient (%)
1.	Survived	146 (73%)
2.	Expired	54(27%)
	Total	200(100%)



**Figure 2:** Pie chart depicting the mortality due to ingestion of various compounds.



In our study the overall mortality rate was 27% accounts for 54 of the total 200 cases received in the emergency department as mentioned in Table 5. Deaths due AIP consumption were the highest 49 cases (90.7%), followed by death due to OPC poisoning observed in 4 cases(7.4%) . Out of the 127 cases of AIP poisoning 49 cases who consumed fresh tablets of celphos died while remaining 78 cases consumed denatured tablets survived. Only 4 deaths occurred out of the 58 cases of OPC poisoning (6.8%) received suggesting a good survival rate on medical treatment and proper patient care in the ICU as seen in Figure 2. Similarly only one patient of herbicide poisoning expired in the ICU out of the 5 cases received inspite of medical management. 4 cases of tricyclic antidepressant poisoning and single case each received of phenol and transfluthrin poisoning survived on proper medical treatment.

**Table 6: OPC poisoning cases symptoms presentations**

Symptoms	Cases	Percentage (%)
Meiosis/ blurred vision	101	79.5%
Salivation	7	5.5%
Bradycardia	Nil	-
Nausea and vomiting	57	44.9%
Lacrimation	20	15.74%
Abdominal pain	7	5.5%
Diarrhea	20	15.7%
Diaphoresis	20	15.7%
Wheezing	50	39.4%
Crepts	13	10%
Muscle fasciculation's & paralysis	7	5%
Hypertension	45	35.4%
Unconsciousness	12	9.44%
Toxic psychosis	25	20%
Seizures	5	3.93%
Ventilatory support	12	9.44%

The above table shows that meiosis and blurred vision was the most common manifestation found in 101(79.5%) of the total 127 cases of OPC poisoning. The peripheral muscarinic (SLUDGE) symptoms occurred acutely within minutes. Salivation however was observed in only 5.5% of the cases. Lacrimation, Diarrhea, diaphoresis was seen in 15.7% of the cases on presentation. Urination was not found as a presenting symptom in either of the cases. Nausea and vomiting was the next common presenting symptom found among 57 out of the 127 OPC cases. Respiratory symptoms followed next in the table with 40% presentation as wheezing. Nicotinic effects of OPC poison resulted in hypertension in 45(35.4%) and paralysis in 7(5%) cases.

12 cases were received in an unconscious state. Seizures were reported in 5 cases only.

Intermediate Syndrome (IMS) develops 24-96 hours after exposure and reflects a prolonged action of acetylcholine on the nicotine receptors. The clinical features are muscular weakness in the ocular, neck, bulbar, proximal limb and respiratory muscles. The risk of mortality is due to the associated respiratory depression. Most patients with intermediate syndrome develop respiratory failure, which requires mechanical ventilation. 10% cases required ventilatory support. OPC poisoning resulted in a mortality rate of 7%. Following atropinization 20% cases reported toxic psychosis after treatment.

Out of the 5 cases of herbicide poisoning received, isopropyl salt of glycoposphate was ingested by 3 cases and 2-D aminosalt 58,52 24-D poisoning was seen in the rest. Herbicides present OPC and carbamate like poisoning. All cases presented with nausea and repeated vomiting. Seizures was observed in one patient who failed to survive on ventilatory support.

Gastrointestinal symptoms are usually first to appear after exposure to celphos or AIP poison. Nausea and vomiting occurred in all the cases however abdominal pain and diarrhea was not reported among any . 76.2% of the cases had hypotension on arrival in emergency along with GI symptoms. 19(32.7%) cases were received in an unconscious state. 6 cases presented with respiratory difficulty and had lung crepts. 33(57%) cases had multiorgan dysfunction on hospital presentation. 9 cases were put on ventilator support.

## DISCUSSION

Poisoning is a health hazard and the preferred means of committing suicide in males and females in India. The common causative factors which led to self poisoning were marital disharmony, poor economic conditions and disagreement with family members.<sup>15</sup>

Interesting change in trend and nature of poisoning has been observed. Among the 200 cases of poisoning, 127(63.5%) cases of AIP poisoning and 58(29%) cases of OPC poisoning have been observed. New chemicals such as tricyclic antidepressants (2%) and zinc phosphide (2%) herbicide(2.5%), phenol and transfluthrin (0.5%) being consumed with a suicidal intent has been observed in the present study. In contrast other studies<sup>1,2,3,7</sup> have reported organophosphates form the largest bulk of pesticide poisoning. Gargi et al 2003<sup>16</sup>, at Amritsar found the poisonings with organophosphate among 17.64% and aluminium phosphide in 38.23% cases. A similar study done in the Haryana-Rohtak belt by Siwach SB et al<sup>17</sup> in 1995 observed aluminium phosphide as the most commonly abused sub-

stance followed by OPC and zinc phosphide in 67.8, 13.9 and 4.3% cases respectively.

In the present study the victims involved were maximum seen in the 3<sup>rd</sup> decade, 72 cases (36%) followed by 49 (24.5%) cases in the 4<sup>th</sup>, 37 cases in the 1<sup>st</sup> (18.5%) and 23 cases (11.5%) in the 5<sup>th</sup> decade. Poisoning cases have been observed in the elderly individuals also 5.5% incidence in the 51-60 and 3.5% incidence in 61-70 year age group. 79% victims are the young population less than 40 years and 21% above 40 years of age in the present study similar to Syed MA et al. 2014,<sup>3</sup> who observed 80.2% of the patients less than 40 years and 19.8% above 40 years. Gargi et al 2003,<sup>16</sup> reported the incidence of poisoning of 45.5% in the 21-30 years age group and poisoning in younger population of 11-20 years at 18.5% in accordance with the present study.

Most of the poisoning cases were from rural areas of Haryana 92.5%, predominantly in the young population with male preponderance. Mean male female ratio being 2.33:1 a pattern similar to that reported elsewhere in India.<sup>1,2,7,15,16</sup>

Villages are more affected by the menace and failure in the life and tolerance to life is better understood by the urban population in the present study in accordance with other studies.<sup>1,2,7</sup> In contrast incidence of poisoning was observed higher in urban areas 51.4% and lower in rural areas 45.59% by Gargi et al 2003.<sup>16</sup>

A season wise variation is seen in the present study, distribution is highest during the rainy, followed by summer season and least in winter season. In summer (March-May) 53 cases, Rainy season (June –August) 60 cases, Spring (Sept- Nov) 49 cases and 37 cases in the winter (Jan- Feb) were observed in the present study. Syed et al, 2014<sup>3</sup> recorded the highest incidence during summer, followed by rainy and least in spring season.

The present study is in unison with other recent studies that suicidal poisoning is the highest among the population.<sup>5,17</sup> In the present study 95.5% cases with suicidal motive and 4.5% of accidental exposure to pesticides, have been observed similar to Syed et al 2014<sup>3</sup>. In contrast a study by Gargi et al 2003<sup>16</sup>, maximum cases were of accidental poisoning 44.4%, followed by 40.60% cases of suicidal poisoning and 3% homicidal poisonings were reported.

The overall mortality rate for OPC poisoning varies from 4%- 30%.<sup>18</sup> In the present study mortality due to OPC poisoning was 6.8% similar to Safdar et al; 2003<sup>19</sup>. These patients had reported late to the tertiary care centre or developed lung complications on ventilator.

Deaths due to aluminium phosphide poisoning is under reported in Indian subcontinent with mortality varying from 37-100%, because of its easy availability since 1992. Mortality due to aluminium phosphide poisoning in the present

study is 38.6% consistent with the literature. Out of the 127 cases of aluminium phosphide poisoning 49 cases who consumed fresh tablets of celphos died while remaining 78 cases consumed denatured tablets survived.

Most symptoms and signs in OP poisoning resulted due to excessive muscarinic stimulation in the present study consistent with previous studies. 10% of the patients developed intermediate syndrome in the present study. Reported frequency of intermediate syndrome varies from 8% to 49%.<sup>2</sup>

## CONCLUSION

Aluminium phosphide is the leading cause of deaths due to poisonings observed in Haryana, predominantly seen in youths residing in rural areas with male preponderance. Lack of education, poverty, stressful life, cheap and easy availability of these compounds were the reasons behind the poisoning. Hence upgradation of primary health care facilities to render immediate management of these poisoning cases could go a long way in helping to reduce mortality and morbidity. Strict implementation of pesticide act and new laws and legislations can be made by the government regarding the free sales of the chemical compounds. Social awareness regarding handling of these compounds and their lethal consequences is required at grass root level especially the rural population. Psychological counseling and educating the youth about the dangerous effects of poisoning should be undertaken by the government on priority basis. Alternatives to AIP or celphos and OPC which are less toxic should be developed by the horticulture department. The use of bio-pesticides, known for their purity, effectiveness and nontoxic nature should be promoted. Organic pesticides like salt spray, neem enriched sprays, mixture of chrysanthemum flower tea extract, mineral oil and citrus oils with cayenne pepper should be marketed by the government to reduce the health hazards. Lab research should be taken to find specific antidote for aluminium phosphide poisoning.

## Conflict of interest

The authors declare that they have no conflict of interest concerning this article. No funding was required for data collection, data analysis and data interpretation of the study.

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